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**RESEARCH
NOTES:**

Project 529

June 2002

Arizona Department of Transportation Information Data Warehouse Application: Evaluation of HERS/ST as a Data Source Component

Background

The mission of the Arizona Department of Transportation is “to provide a safe and efficient transportation system, together with the means of revenue collection and licensing for Arizona.” Specifically, the Arizona Department of Transportation develops and operates the transportation infrastructure; develops and employs a measurement system that provides information for securing and allocating resources and improving performance; and allocates resources according to mandates, planned priorities, customer requirements, and return-on-investment so as to improve the movement of people and products throughout Arizona. The Arizona Department of Transportation reports to the governor of Arizona.

The current Five-Year Transportation Facilities Program for fiscal years 2002-2006 shows that through 2006, the Arizona Department of Transportation plans on spending approximately \$3.9 billion. Of that, about \$700 million is

planned just for preserving the current assets. There are six major categories of preservation and 22 sub-categories. Developing spending plans require examining data from districts, municipal governments, public groups, and others who request projects. Matching requests with a funding source with priorities that will provide the maximum benefit to the public is just one of the reasons that decision support systems are needed.

Benefits from Arizona Department of Transportation projects come in the form of improved transportation system performance, reduced travel time, increased safety, job creation, and the economic impacts associated with improved transportation system performance. This presents management, political, environmental, and legal challenges. Funding and financing of Arizona Department of Transportation projects comes from state revenues and federal government funds. Debt supported by tax revenues is also used. Federal funding, for instance, may come from over twenty

separate sources earmarked for specific spending categories or projects. As a result, projects must be tracked by funding source, and analysis for budgeting must recognize the nature of this situation. To manage this and to respond to the dynamic nature of the budgeting process, Transportation Infrastructure Asset Management needs executive decision support tools for analyzing, comparing, and establishing priorities. This need applies to all assets under the jurisdiction of the Arizona Department of Transportation. The purpose of this project was to:

- ❑ Determine if the Highway Economic Requirements System (HERS) analysis program is suitable for use by the Arizona Department of Transportation for establishing priorities and managing assets;
- ❑ If not, determine if it could be made suitable with some manageable modifications; and
- ❑ If no manageable modifications seem reasonably workable, recommend a path the Arizona Department of Transportation should take for achieving its asset management objectives given the internal data system available and the data warehouse under development.

Approach

A team of graduate students in the Management Information Systems Department undertook as a class project Arizona Department of Transportation Project #529: Arizona Department of Transportation Information Data Warehouse Application. The effort, stated in the Arizona Department of Transportation Solicitation was "...to research and develop a plan to utilize the Asset Information Data Warehouse as the analytical engine for the effective management of its infrastructure assets (Roadways, Bridges, and Rights-of-Way)." The Arizona Department of Transportation started development of the Asset Information Data Warehouse at the end of year 2000. The Asset Information Data Warehouse will be used as a decision support system (possibly in conjunction with existing supplementary software) for Transportation Infrastructure Asset Management. However, ways in which the Asset Information Data Warehouse information and other information available to the Arizona Department of Transportation will be used are needed to effectively prioritize, propose, and provide performance feedback for Arizona Department of Transportation programs.

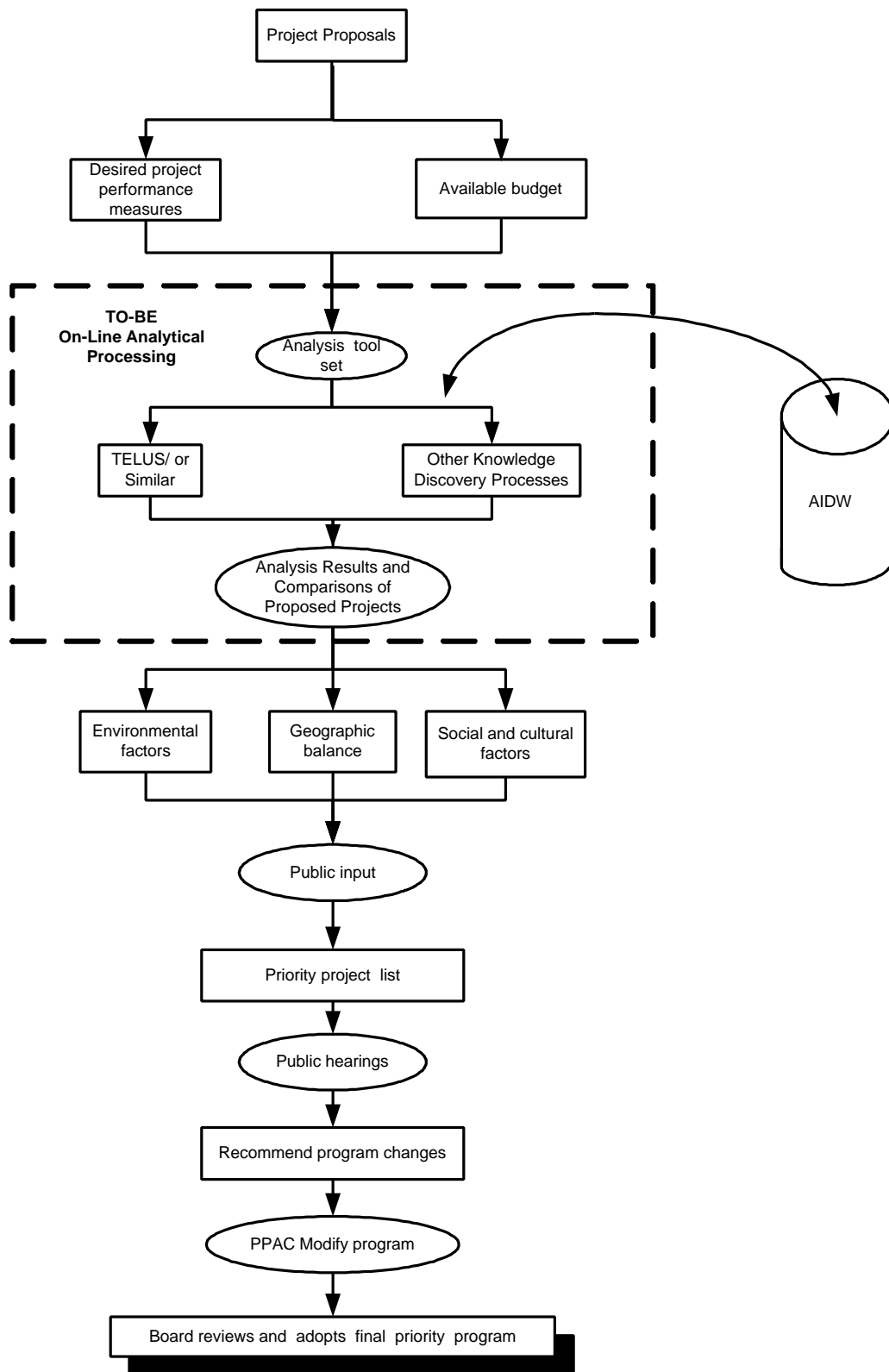


Figure 3-1 Transportation Infrastructure Asset Management Recommended TO-BE Process

Findings

The team gathered information from the Arizona Department of Transportation management and other users of information. Plans and the existing status of Asset Information Data Warehouse, the legacy databases, and the other databases within the Arizona Department of Transportation to be used were assessed to better understand the body of data available and the specific goals of Transportation Infrastructure Asset Management (TIAM). The Highway Economic Requirements System computer program was evaluated (Section 4) and operated (Appendix A) to determine its methodology and applicability for meeting Transportation Infrastructure Asset Management needs as well as prepare operating instructions. Searches were made to identify other analysis packages that could meet Arizona Department of Transportation requirements. The team concluded that:

- The Highway Economic Requirements System, even when modified for the Arizona Department of Transportation environment, will not meet Transportation Infrastructure Asset Management requirements for managing all of the Arizona Department of Transportation assets (highways, bridges, aviation, transit, other) and is not a product on which to base an On-Line Analytical Processing (OLAP) System from either a user or an organizational viewpoint.

- A model framework for an analysis package exists that can be a start for achieving Arizona Department of Transportation asset evaluation needs. This package is the Transportation Economic and Land Use System (TELUS) and was developed by the Institute for Transportation, New Jersey Institute of Technology, in conjunction with the Center for Urban Policy Research at Rutgers University. The Transportation Economic and Land Use System is available free to state Departments of Transportation.

Recommendations

The team recommends that the Arizona Department of Transportation develop a System Requirements Document for the On-Line Application Processing to be used with the Asset Information Data Warehouse and also investigate the Transportation Economic and Land Use System model framework further with the goal of incorporating it, or a functional equivalent yet to be identified, into the Asset Information Data Warehouse system for use and subsequent enhancement by Transportation Infrastructure Asset Management for managing all Arizona Department of Transportation assets.

The Team also recommends an approach that makes the Transportation Infrastructure Asset Management, On-Line Analytical Processing, and Asset Information Data Warehouse an integrated methodology in the Arizona Department of Transportation planning and budgeting process.

The full report *Arizona Department of Transportation Information Data Warehouse Application: Evaluation of HERS/ST as a Data Source Component* by Siyuan Huang, Norman Jetta, Dan Keltner, Xianying Wang and Britton Watson (Arizona Department of Transportation, report number FHWA-AZ-02-529, published June 2002) is available from the Arizona Transportation Research Center, 206 S. 17 Ave., mail drop 075R, Phoenix, AZ 85007; phone 602-712-3138.